called "bandwidth-on-demand". HPCN will offer relatively low speed data (for ordinary position determination information (i.e., within 300 yards), paging and associated messaging and mass calling services), synchronous and asynchronous data, and high speed data rates up to 144 kbps suitable for full- or half-duplexed compressed video, multimedia and ISDN-based applications. Alternatively, the whole bandwidth of the mobile downlink allocation (e.g., 19 MHz at S-Band) can be used for special, premium precision position determination (i.e., within 100 yards), provided the user has a compatible terminal. Thus, if position determination, total ubiquity and seamless mobility, continuity of data communications, and/or point-to-multipoint (broadcast data) transactions are important to the application, then HPCN is the superior if not the only capable alternative.

HPCN's nationwide operations, combined with its one personal number user identifier,[22] allow the user to both be located (position determination) and contacted (called) using one service and one device. The HPCN terminal's "keep alive" and automatic position determination signals will be monitored constantly by the network controller such that its data base will always know where the subscriber can be reached.

Compare this capability with the illustration from a recent article in the *Washington Post* in which a roaming cellular

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[22] While it will be possible simply to assign subscribers a conventional ten digit number from number blocks obtained through the local exchange carrier or even Bell Core, considering the potentially large number of individual subscribers likely to be involved with the service a special HPCN numbering plan would be desirable. Considering that the North American Numbering Plan is scheduled to be revised in the mid-nineties, it would be expected that HPCN interests will participate in that effort to ensure the availability of a suitable numbering scheme.

customer is pictured using both a nationwide pager (required for locating the called party) and a portable phone (required to return the communications), and, incidentally, the latter tethered to his vehicle as a source of battery power. (See, "Phone Firms Propelled Into Future", *Washington Post*, January 10, 1992, p. C-1, appended hereto as EXHIBIT 1.) With HPCN, one device and one service would serve the equivalent functions achieved today using a nationwide pager in combination with cellular telephone at less cost, and certainly with greater convenience.

The position determination feature, which is inherent to the HPCN system configuration and will be offered at almost no incremental cost to the user, will also facilitate special billing arrangements, fraud detection and user verification, and, of course, will become an invaluable aid to police, fire, health and other public safety groups for personnel or vehicle location and other obvious emergency uses.

HPCN will prove important to meeting emerging needs, particularly for high speed data, compressed video and multimedia applications. HPCN is wedded to CDMA with FEC coding; and while this is still new as a commercial technology, the results of **CELSAT**'s analysis as confirmed by recent field trials in San Diego have been both very exciting and convincing.[23] CDMA offers many inherent advantages especially suited to wireless digital data transmissions at bit rates much higher than other multiplexing schemes in a mobile environment. CDMA's "soft handoff", coupled

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[23] See, "Next generation Cellular -- Results of the Field Trials", December 4-5, 1991, presented by the Cellular Telecommunications Industry Association.

with HPCN's simultaneous space/ground coverage of the personal/mobile user assures relative continuity of communications from cell-to-cell or, in the event of ground signal interference, within a cell. This, in turn, allows HPCN to offer both synchronous and asynchronous data, and full- and half-duplex video communications with a very high degree of reliability. Moreover, HPCN reliability is heightened when it is considered that the target HPCN market will include a high proportion of high speed data applications which will rely predominantly on portable transceivers (notebooks, laptops, and similarly portable video devices) which will be less likely to be transitting between or out of the range of cells (in contrast to more mobile vehicular-based voice and fax units).

Clearly contributing most to the feasibility of high speed data under HPCN is, again, the enormous network capacity. High speed data users consume available power in proportion to the data rate used. (Data transmissions at 64 Kbps, for example, will consume about 13 times the power required for an ordinary voice call.) Because HPCN will have capacity to spare, it can afford to accommodate several high speed data transactions without degrading the level of service available for other, more conventional uses, and with no economic penalty to the data user. **CELSAT** has proposed in its application to offer data speeds up to 144 Kbps so as to be compatible with the basic ISDN interface (BRI). While still higher speeds are attainable, in **CELSAT**'s judgment 144 Kbps might be an

judgment 144 Kbps might be an acceptable place at which to draw the line without compromising grade of service.[24]

C. HPCN Will Make Low Cost Personal, Business and Public Sector Communications Available to The Greatest Variety of Markets and Applications

The utility and improved communications made possible by conventional cellular telephone service is undisputed, while for many applications or market segments it is becoming essential. One of these is the public sector. Local, state and even federal agencies have come to rely more and more on the convenience, accessibility and relatively high performance of conventional cellular telephone services. But government budgets cannot afford the high cost of conventional cellular service and therefore the public sector is not realizing as much benefit as wireless technology has to offer. HPCN will provide even more functionality (and privacy) at the same or less costs than other commercial wireless alternatives. And, due to the competition and capacity which HPCN will introduce into the market, that cost will be lower and thus more affordable to the public sector in the near future than it is today.

Among other market segments to benefit from HPCN include aircraft and ships at sea. While HPCN will be capable of providing personal communications to aircraft passengers (with some

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[24] Hitachi, Ltd. recently announced a desktop (not wireless) video conference unit for use with ISDN 64 kbps service. "Hitachi Unveils Cheaper Video Conference Unit", *Wall Street Journal*, January 31, 1992, at B3. Also, AT&T recently announced introduction of a video telephone operated at 19.2 kbps. "AT&T Plans To Unveil a Videophone For the Home", *Wall Street journal*, January 3, 1992, at E3. Also, Apple Computer announced that in 1993 it will introduce pocket-sized electronic information devices using communications links, "Apple Plans to Launch Product Lines Aimed at Consumer Electronics Markets", *Wall Street journal*, January 10, 1992, at B8. HPCN will be compatible with each of these products via its interface with the PSTN.

limitations), it's real value will be as a very low cost combined communications and supplemental rescue and navigation system, particularly for private and smaller ships and planes. An HPCN terminal will automatically deliver instant position determination, even at high altitudes, as an inherent function of the CDMA technology, accurate to within 300 yards, and at no significant additional cost than any ordinary HPCN terminal.[25] Similarly, and considering that any HPCN system will include a fair amount of coverage over the great lakes and coastal waters, the cost of improved safety, rescue missions and precise navigation at sea will be within reach of anyone who can afford a watercraft.

Between space-cell and ground-cell coverage, there will be no gaps, no blind spots, and no unserved territories. With HPCN and one single-mode terminal for both space-cell and ground-cell connections the subscriber will be able to make or receive a communication anywhere -- on the ground, in the air, or at sea. Thus, it should be apparent that the strengths of an HPCN lie not only in its potential ability to supplement many current services more efficiently and at lower cost to the end user, but as a platform for launching new services to meet both more demanding and emerging applications, and new and currently unserved geographic and public service markets.

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[25] Users terminals designed for critical applications will be of highest quality and equipped with superior displays and operating conveniences best suited to the environment in which they will be used. Accordingly, they are likely to be higher cost devices.

V. HPCN WILL BEST SERVE OTHER IMPORTANT ASPECTS OF THE PUBLIC INTEREST

HPCN will be welcomed as a timely, reliable and readily available service. HPCN should be reasonably accessible to users everywhere. It will serve as a superior means of emergency communications in case of natural disasters spanning very large areas or regions, and can be tailored to meet proprietary communication needs of very small "microcell" communities.

A. HPCN's Capacity and Geographic Coverage Is Expandable, Flexible, and Quickly Deployable

As already pointed out, HPCN will serve more potential end users simply because it offers more available *capacity* -- nearly the capacity of another MCI landline network. But not to be overlooked is HPCN's geographic breadth and the thoroughness of its coverage. A well designed HPCN will ensure total coverage over the continental United States, Puerto Rico, the Virgin Islands, Hawaii and most of the populated areas of Alaska, and the entire rural and remote parts of the country where other systems do not reach. HPCN leaves no "gaps" in *either space or time* coverage over the United States. Thus, HPCN will serve the largest possible number of customers because it simply will *reach* more people with the capacity to serve them at a low price. These considerations, coupled with the its greater functionality, reasonably assure HPCN of a potential subscriber base of between 10 and 30 million users.

Another HPCN advantage is that the system can be *deployed quickly*; it does not have to be built out to maximum capacity all at once, and therefore will reach the market in the

shortest time following Commission authorization. HPCN can be developed in stages, as its customer base grows, and as funding becomes available. In fact, any such system would start out with just one satellite, with the other deployed later. A one satellite configuration will still provide total ubiquitous coverage over the United States with the same number of space-cells (but with only about three fifths the communications capacity). Position determination would be limited or unavailable until the second satellite was in orbit.[26]

B. HPCN Will Integrate/Focus Communications Throughout Local, Regional And Nationwide Communities of Interest

An HPCN network can be flexibly configured -- focused or dispersed. **CELSAT**, for example, would group HPCN space-cells into regional market service areas (i.e., "clusters") on either a contiguous or non-contiguous basis. Most clusters would include up to ten space-cells, logically and contiguously situated around each major U.S. regional population center or economic market. The cluster would be served by a single backhaul link and gateway.[27]

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[26] Position determination will use combinations of either space-to-space, space-to-ground-cell, and ground-cell-to-ground-cell position information. Thus, with only one satellite deployed full, automatic position determination would be available only to subscribers calling from within an active ground-cell service area. Also, full, automatic space-based position determination under **CELSAT**'s design will not be available in Puerto Rico/Virgin Islands, Hawaii and most of Alaska which will only be visible to one satellite even after both are deployed. The eastern satellite will cover CONUS, Puerto Rico/Virgin islands; the western satellite will cover CONUS, Alaska and Hawaii.

[27] For a technical discussion of the "clustering" concept see Appendix "Overview of **CELSTAR** System", Appendix A hereto, and **CELSAT**'s pending application. Other HPCN configurations are, of course, possible.

Communications within these relatively large regions (each likely to be about the size of a Regional Bell Operating Company territory) would be treated like a super-sized "local calling area", thereby allowing for low cost, toll free-like calling throughout the whole regional "community". Each space-cell belonging to the cluster (and all ground-cells within such space-cells common to that cluster) would share access to a common network controller, common database, common switched access to the PSTN, and common SS#7-type signaling and network intelligence for added service functionality and efficient, secure operations.

With the exception of Guam and other Pacific Rim U.S. territories and possessions, no U.S. geographic market would be isolated or difficult to reach. Non-contiguous locations such as Hawaii, Alaska and the Virgin Islands logically should be tied to CONUS as members of the "clusters" with which they have the greatest common interest (i.e., Hawaii with California; Alaska with the Northwest; and P.R./V.I. with the Southeast). Thus, low cost communications to or from the mainland would be possible using the space-based channels, with no backhaul cost penalty for ordinary local communications within those remote markets.[28]

As yet another alternative, and again as demonstrated in **CELSAT**'s application, at least one "cluster" could be made up of non-contiguous space-cells serving key U.S. population centers or economic market areas. This configuration would form a "metropolitan bus" over which there would be direct communications

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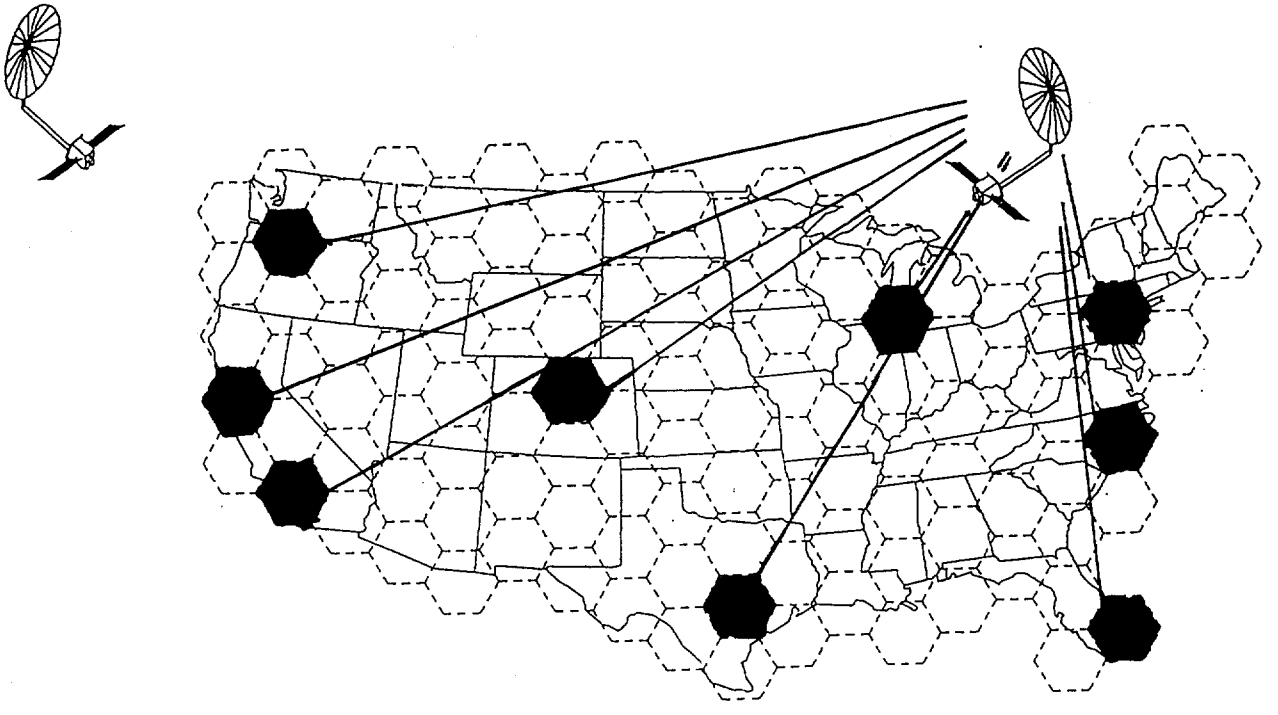
[28] It is possible to have multiple earth stations or hubs serving the same HPCN cluster. It would be logical to service the space-cells associated with Alaska, Hawaii and P.R./V.I. from both a CONUS-based hub, and a redundant, local hub to avoid backhauling traffic.

by space-cell channels on an end-to-end basis. The metropolitan bus (Figure 3) would permit either wireless-to-wireless or wireless-to-wireline high speed communications from one distant population center to another, and otherwise serve special-purpose priority or high volume applications between and among such centers.



Illustrative HPCN Metropolitan Bus

FIGURE 5

Further indicative of HPCN's flexibility, ground-cell size in terms of coverage area can be very selectively controlled. For example, ground-cells could be very small (i.e., PCN-like microcells), or scaled to overlay many existing mobile cellular coverage areas (i.e., about 6 kilometers radius). **CELSAT** envisions considerable overlap with existing cellular systems in the major market areas. But HPCN microcell configurations could also be deployed to satisfy the particular needs of a special market or

end-user application where neither conventional cellular nor emerging PCN would be technically or economically feasible. For example, industrial, commercial or university campuses, in either urban or rural locations, and military bases located at very large rural tactical training sites reasonably could support proprietary HPCN microcells. Whether a separate subband would be allocated to meet such need, or the site would be served using other subbands apportioned for public use within the common space-cell area would be considered on a case-by-case basis. Such proprietary microcell systems and their terminal devices, however, would still have to be technically compatible with and under the control of the overall HPCN space/ground system operator.[29]

C. HPCN's Redundancy and Utility As An Emergency Communications System Is Superior

A *hybrid personal communications network* of **CELSAT**'s design has superior standby and inherent backup features unlike any alternative other than the local exchange network itself. These qualities serve both to enhance its own reliability, as well as position HPCN as the fall back network of choice in the event of local or regional natural disaster.

As to the former, it has been discussed above how both space and ground-cell systems can operate on one satellite in the event the other satellite should fail. Total ubiquitous coverage over CONUS would remain, although there would be a reduction in service capacity. Similarly, the HPCN space-cells would still

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[29] This could be a benefit in that the proprietary microcell user community could, on the one hand, block non-member traffic, while still use their HPCN terminals for access to the "public" HPCN system.

carry traffic in the unlikely event any portion or even all of the ground systems failed. In fact, space-cell capacity could be increased slightly in the affected space-cell areas by re-deploying the ground-cell subbands for satellite use.

Thus, not only is the HPCN's own reliability assured, but its value and ability to meet the demands of almost any conceivable local or regional disaster as a versatile, high capacity emergency backup communications system is unmatchable.

VI. THE COMMISSION SHOULD ALLOCATE FROM 32 TO 37 MHz FOR A HYBRID PERSONAL COMMUNICATIONS NETWORK IN EITHER THE RDSS L/S-BAND OR S-BAND

CELSAT has identified at least two band pairs of modest spectrum bandwidth, each well suited to the operation of a separate *hybrid personal communications network*, and also well within the technical reach of today's mobile satellite and personal transceiver power and other relevant operating capabilities. Moreover, when used for HPCN purposes as proposed, certain interference problems and capacity constraints characteristic of other alternative mobile satellite proposals either go away or are mitigated.

A. HPCN Is The Most Spectrally Efficient Wireless System By Far

CELSTAR's frequency efficiency factor in the satellite-only mode is at least five (5.3) times better than that of the next most efficient space system proposal; while, with simultaneous ground utilization included, frequency efficiency increases by two orders of magnitude over any other method described. Each space

cell in each cluster reuses all (i.e., 100%) of the available spectrum with no spatial cell separation required (i.e., **CELSTAR**'s S-Band reuse factor *over the United States* = 112 [149 for L/S-Band]).[30] **TABLE** I, *supra*, illustrates the far superior frequency conservation characteristics of an HPCN system such as **CELSTAR**.

B. An HPCN System Could Operate Most Efficiently At the L/S-Band (1610-1626 MHz/2483.5-2500 MHz); Alternatively, An HPCN Should Be Permitted At the S-Band, (2110-2129 MHZ/2410-2428 MHz).

The *hybrid* system frequency requirements call for 2 duplex bands. Petitioner requests that the Commission establish at least one band pair allocation for an integrated space/ground *hybrid personal communications network* with satellite-user links in either of the following two bands:

- Band A -- 2,110 to 2,129 MHz and 2,410 to 2428 MHZ
- Band B -- 1,610 to 1,625.5 MHz and 2,483.5 to 2500 MHz

Use of these bands should be restricted to HPCN on a primary basis, with no secondary sharing with another HPCN, ground cellular or other satellite-based service.

CELSAT's proposed use of the Band A frequencies is consistent with the generic mobile satellite services use being proposed by the U.S. delegation at WARC 92.[31] However, should these frequencies be considered unavailable, an HPCN is equally suited

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[30] **CELSAT** wishes to emphasize that the reuse levels attained using HPCN apply proportionally with the area to be served. Thus, its reuse factor would be proportionally larger and thus even more astonishing if its potential capacity to areas outside the U.S. were also considered.

[31] Id., n. 1.

for operation in Band B, currently allocated for RDSS services, and could also operate in a portion of the 220 MHz of spectrum recently proposed for "Emerging Technologies".[32] Because of the slightly lower frequencies involved, HPCN's large antenna actually attains greater communications capacity out of slightly less bandwidth at the Band B allocation (i.e., over 60,900 VG circuits using 32 MHZ at Band B, versus 56,789 using 37 MHz at Band A).

An HPCN of the **CELSAT** design would also require satellite-hub ("backhaul") links of between 160 MHZ and 195 MHz bandwidth in K-Band at 21 and 30 GHz, depending on the band allocated.

A complete frequency plan for an HPCN system of the type defined by this petition and in **CELSAT**'s application appears in Appendix B, for both the space- and the ground-cell segments, and is summarized in Table B-1.

Accordingly, The Commission should amend Part 25 of its rules to provide either a Band A or Band B allocation for at least one nationwide HPCN system.

C. HPCN Minimizes Many Frequency And PFD-related Problems; But The PFD Limits Should Still Be Relaxed

CELSAT, of course, is proposing (*infra*) that one licensee be given exclusive, primary use of an HPCN spectrum allocation. Should an HPCN be required to share the spectrum with other CDMA users it would lower spectral efficiency, raise costs and thus ultimately the price of service to end users. Furthermore, as

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[32] See, "*Allocation of Emerging Technology Bands For Future Requirements Proposed*", ET Docket 92-9, FCC NEWS Release, January 16, 1992.

discussed below, it would create extreme technical control and interference problems. Therefore, rather than require such sharing of one band, **CELSAT** submits that it would be far better to consider allocating another spectrum block of comparable bandwidth for similar exclusive use by another HPCN provider.

Meanwhile, **CELSAT** agrees with the many other applicants for the L/S-Band RDSS spectrum which have proposed that the Commission should relax the power flux density limitation currently applicable under Commission and international rules to both Band A and Band B.[33] **CELSAT**'s proposed HPCN configuration suffers a substantial loss of capacity if it is required to conform to the current PFD limits, although it would still be economically viable and would have many more times the capacity of any other proposed system if it were required to conform to current levels.

In addition to all that is already before the Commission on this subject, **CELSAT** has appended its own analysis further demonstrating that an HPCN could operate harmlessly and most effectively if the PFD limits for domestic use were relaxed by just 6 dB. (See, Appendix C.) In reaching this conclusion **CELSAT** relied heavily on the 1984 study by the NTIA, in which it concluded that the PFD limits in the bands relevant to this petition could be relaxed by up to 10 dB.[34]

CELSAT has also addressed the issues of potential interference to other spectrum users in both Bands A and B, and is pleased to be able to report that it appears that its HPCN design

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[33] See, for example, petitions for rulemaking, RDSS L/S- Band, by TRW, Inc., RM-7773; Constellation Communications, RM-7771, and Ellipsat, RM-7805 .

[34] See, Appendix C at pages C-12.

either does not create the interference concerns raised by the proposals of other applicants (particularly in the requested L/S-Bands), or, where an interference problem might otherwise exist, HPCN's inherent flexibility offers solutions for avoiding the problem not available under any other system proposal. See Appendix D. For example, **CELSAT**'s large number of individually controllable transponders permits very selective power control on a space-cell-by-space-cell basis.[35] This allows much closer conformance to international frequency and power limitations along the Canadian and Mexican borders then any other proposed system. HPCN also offers the ability selectively to control frequency subbands and power levels in areas susceptible to interference with other users of the spectrum, such as for radio astronomy purposes. HPCN's control over power to non-interfering levels is not only geographic, but also time-of-day variable, thereby allowing the HPCN to cut power in vicinity of other users of the spectrum during coordinated periods of actual use, and resume power in order to restore full capacity at all other times. Clearly, HPCN offers the Commission a technical solution to difficult spectrum interference problems unavailable in the context of any other system proposal.

D. Link Budgets and Other Demonstrative Analyses

In the course of preparing its application for an HPCN system, **CELSAT** has undertaken an extensive analysis of its link power budgets and other factors necessary to demonstrate compliance

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[35] The space-cell locations along the U.S. borders as shown at Figure 1, *supra*, are illustrative only. Their actual position and effects on international frequency compliance relative to the U.S. border will be adjustable and controllable.

with Appendix B of the Commissions Memorandum, Opinion and Order establishing application requirements for geostationary satellite applications.[36] The results of **CELSAT**'s analyses are positive and impressive, and are partially included as Appendix E to this petition.

Reference to this and the other materials appended to this petition serves partially but convincingly to demonstrate the complete technical feasibility of the HPCN concept as reflected in at least one extremely credible design.

VII. THE COMMISSION SHOULD DEVELOP HPCN LICENSING PROCEDURES, STANDARDS AND OPERATING RULES THAT ASSURE MAXIMUM USE OF THE SPECTRUM, SERVICE FLEXIBILITY TO MEET END USER NEEDS, COMPETITION AND BUSINESS OPPORTUNITY

The *hybrid personal communications network* concept described in this petition is larger and more comprehensive than any single radio-based personal communications system or service proposal ever before considered by the Commission. In terms of potential subscribers, an HPCN such as proposed by **CELSAT** is potentially as large or larger than the existing analog wireline and non-wireline cellular industry systems combined, plus all the proposed MSS/RDSS satellite systems, all operated together as one huge domestic space/ground radio communications network. As such, its capacity and potential not only to serve subscribers but also to revitalize American industry and leadership in the production

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[36] *Space Station Application Requirements*, Memorandum, Opinion and Order, 54 RR 2d 565, Appendix B, released August 12, 1983.

and supply of wireless devices and supporting network infrastructure subsystems and space components is equally enormous.

There is an important anatomical difference between HPCN and the existing/emerging wireless industry structure. Whereas the latter is molecular, with numerous ground cellular systems and the proposed satellite MSS/RDSS systems operating under different technologies and owned by many separate competing entities, the HPCN concept is atomic-like. Around each *hybrid* geostationary satellite system there will evolve from one to hundreds of small, functioning ground-cells, each tied to the satellite nucleus under the influence of its system network controller.

In most respects, multiple entry and separate allocations of geographic territories have worked well in that clearly we have the world's finest cellular service, the first nationwide satellite paging and air-to-ground in-flight passenger services, and soon, using one system or another, we will have MSS/RDSS satellite services. On the other hand, the prevailing wireless industry dichotomy is not without its drawbacks including, for example, the high cost of air time; insufficient mobile system capacity due to uncoordinated spectrum sharing; gaps in service coverage; problems with billing; difficulties in locating roamers from one system to another, etc. Additional problems can be expected including the probable incompatibility among next generation digital cellular

technologies,[37] and similar incompatibility between emerging space and existing ground-based systems.[38]

Nationwide HPCNs present an opportunity to avoid incompatibility and related problems from the outset, but it requires a different business/industry structure. Fully functional, maximum capacity HPCNs must be constructed and operated as single, nationwide systems, each under the control of one licensee. As **CELSAT** discusses below, this is primarily for technical rather than purely economic reasons.[39] But, as **CELSAT** also proposes, such a nationwide license structure is possible without compromising the Commission's contemporary pro-competitive objectives. Accordingly, **CELSAT** has outlined proposed rules which could form the basis for HPCN policies and licensing procedures extremely conducive to:

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[37] The cellular industry through its national trade association, CTIA, has recently approved a TDMA standard suitable for next generation technology, and many cellular systems have committed to this format, including systems in Los Angeles, Chicago and Dallas. Id., n. 13. CDMA, on the other hand, is also likely to be approved as an alternative technology, as could NAMPS. The unfortunate end result may well be a patchwork of partially or even totally incompatible operating systems, effectively either reducing the utility of future cellular telephones to localized or regionalized service, or requiring high cost, dual mode handsets. While the heavy consolidation going on within the cellular industry will serve to mitigate the potential effects of diverse and incompatible cellular technology, the fact of such consolidation is, itself, another argument in favor of authorizing a single, nationwide HPCN.

[38] These problems have been somewhat eliminated in other parts of the world, for example, where countries like Germany and Great Britain have granted national licenses for cellular and/or PCS networks. National licenses, whether for digital or analog systems, allow the licensee to design and construct a fully integrated network to compete with other service providers. Regulatory bodies ensure that the licensee will meet network build-out and operating guidelines by mandating coverage milestones, much like local U.S. communities do for cable television.

[39] **CELSAT**'s proposal of nationwide HPCN network licenses is not grounded on economic justifications alone. Deployment cost and economies of scale are not the principal reasons for the nationwide licensee approach. HPCN, as proposed by **CELSAT**, is a low cost satellite system (for example, several HPCN systems could be deployed a less cost than an IRIDIUM system). As pointed out in the text to follow, **CELSAT**'s approach is dictated more by technical constraints, operating limitations, and a national policy favoring the best possible use of the scarce spectrum resource.

- Competition with other existing cellular and other proposed satellite and PCN systems;

- Early and lowest cost deployment of a nationwide HPCN system;

- Flexibility to create and offer the greatest array of new services;

- Low cost service to the maximum number of subscribers;

- Maximum new business and employment opportunities, particularly among device and infrastructure suppliers;

- And greatest frequency efficiency.

CELSAT's general proposal for amending Part 25 of the Commission's rules is merely outlined below, and more conveniently listed in EXHIBIT 2. In addition to amending Part 25 to allocate either Band A or Band B on a primary basis for exclusive use by one license as a *hybrid personal communications network* ("HPCN"), the Commission should consider the following.

A. HPCN Definitions and Scope of Service

The Commission should recognize an appropriate definition of a "*hybrid personal communications network*". For this purpose, **CELSAT** proposes that Part 25, Subpart A, Section 25.103 of the Commission's rules be amended as follows:

Definition:

Hybrid Personal Communications Network. The term Hybrid Personal Communications Network ("HPCN") refers to an integrated combination of high capacity, very spectrally efficient (at least 1000 5 kbps space channels/MHz) space- and ground-cellular systems capable of:

a. Satellite personal/mobile communications and position determination service coverage over the continental United States

b. Ground cellular personal/mobile and position determination service coverage within space cells

c. Space/ground communications in compatible spread spectrum CDMA format with forward error correction (FEC) encoding

d. Transparent and integrated transfer of communications from cell-to-cell and between space/ground-cell types

e. A wide range of personal/mobile digital communications and position determination services, including high speed bit rates

f. Such communications capability must be able to use all subbands within the same contiguous HPCN allocation

g. Dynamically redistributing portions of the subbands within of the allocated spectrum and other resources alternately between space and ground segments as needed to accommodate changing load and service requirements.

In addition, the scope of service permitted under licensed HPCN operations should be broad and flexible, to reflect its tremendous capacity and variable digital characteristics, as well as the changing marketplace requirements for more data-oriented and combined voice/data/position determination, compressed video and multimedia wireless capabilities. This freedom should be expressed liberally in another definition such as the following:[40]

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[40] An HPCN service should not be constrained to offering voice and other personal/mobile services merely on an "auxiliary" basis. Thus, to the extent that the RDSS L/S-Band (Band B, *supra*) is allocated for HPCN purposes this petition should be treated as a proposal to change current rule Section 25.141(d) (47 C.F.R. §25.141(d)) to permit services of the scope included in the definition proposed above.

Definition:

> *Hybrid Personal Communications Network Services.* Permitted HPCN services include any digital one-way or two-way communications of voice, data, video, image or position determination information originated or terminated over a hybrid personal communications network to or from either a portable, mobile, or special-purpose fixed terminal or transceiver operated at low power with unswitched low gain antenna for either point-to-point or point-to-multipoint personal, business, commercial or public safety purposes over land, air or water.

B. The FCC Should Authorize Only One Licensee Per Nationwide HPCN System

CELSAT is mindful of the Commission's strong preference for a multiple entry competitive market structure. As much as possible but without sacrificing any of the important distinguishing attributes of the HPCN approach (i.e., frequency efficiency, space/ground capacity, and cost effectiveness), **CELSAT** is proposing below a means whereby some sharing of the requested spectrum can be realized, while the Commission authorizes only one *hybrid personal communications network licensee per spectrum allocation*. But irrespective of whether **CELSAT**' spectrum sharing proposal is adopted, in order to ensure maximally coordinated reuse of the spectrum, it is technically essential that there be only one such nationwide system operating in a spectral band pair.[41]

As discussed above, one of the most powerful features of the HPCN concept is the ability to dynamically allocate resources, including spectrum, between the various service demands of

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[41] This is not to state that other HPCN systems might not be considered at other band pair allocations.

different time and place. In particular, this includes the internal use of the spectrum subbands for either ground-cell or satellite-based personal/mobile service as the demands of the time, circumstances and place dictate. In order to realize this important flexibility it is technically essential that the HPCN band allocations be primary and exclusive, and under the active supervision of a *single point of control*.[42]

CELSAT's studies indicate that secondary use coordination problems between ground-cell use and other fixed services is essentially the same as that between other mobile satellite systems and the fixed services. The problems between either class of mobile user and fixed service users are essentially the same. Either problem can be solved operationally.

But there is a more fundamental "near-far" incompatibility between *simultaneous* ground-cell and space-cell use of a given subband. A satellite mobile transmitter which might happen to be very near a band-sharing fixed ground mobile receiver site can *easily impose* an interfering signal as much as 60-80 dB greater than the desired signal.

Similarly, a satellite mobile receiver which might be near a band-sharing fixed ground-cell transmitter site might *suffer* interference from the site some 60-80 dB greater than its satellite

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[42] Any requirement to share an HPCN band on the basis of a proportional allocation of either the spectrum or power flux density necessarily results in a corresponding reduction in the potential capacity of each sharing system such that the sum of the individual capacities would be less than the "whole". Even if each co-sharer of the allocated spectrum agreed to build and construct identical HPCN satellite systems with a combined theoretical ability to attain the same maximum space-cell capacity notwithstanding power sharing, the resulting multiplicity of system satellites, hubs, network controllers, etc., would be tremendously wasteful and nowhere near as cost effective as one single system efficiently using all of the available spectrum band.

signal. So both the ground-cell and space-cell system can expect frequent wipeouts irrespective of any practical band spread protection.

This means that if a subband resource is to be subject to dynamic reassignment between the two elements of the system, the rather complex coordination process must be under total control of a single jurisdiction so that such conflicting simultaneous use is positively precluded. **CELSAT** believes that this can only occur if HPCN allocations are each under the control of a single licensee.

In addition to the above firm technical requirements, there are capacity and economic reasons why a single licensee is desirable. Even if it were technically feasible to share such an allocatable resource, to do so would seriously degrade its effectiveness, as no single sharer could be assured of enough total capacity to permit relatively quick or even long term commitments to emergency ground-cell use without possibly unacceptable impact on its primary satellite grade of service.[43]

For these reasons, **CELSAT** submits that the Commission should adopt a policy of authorizing one and *only* one entity to construct and operate a *hybrid personal communications network* within any single HPCN spectrum allocation.

CELSAT's proposal with respect to one licensee per allocation is, of course, not without contemporary precedent. In its MSS Licensing Order, General Docket No. 84-1234, 2 F.C.C. Rcd. 485 (1987), the Commission ordered all "qualified and willing" MSS

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[43] This further assumes that dynamic apportionment of subbands would be practiced in a shared, multivendor environment. In practice, it would not work.

applicants to form a consortium and propose a single satellite system. The Commission concluded at the time, based upon the applications before it and the submissions of various parties, that only one MSS system could be licensed in the allotted spectrum due to economical and technical constraints. More specifically, it found that none of the proposed systems was capable of sharing the MSS frequencies with another system, and that authorizing multiple systems to share the spectrum "is not a feasible licensing alternative". Id. 486. The Commission also rejected a band segmentation solution for achieving multiple licenses on the basis of economic viability and because such an approach could not assure a sufficient variety of services to best serve the public interest. The Commission concluded that the award of an MSS license to a single consortium would be more efficient, less costly, and more likely to meet its desire to see MSS services deployed most expeditiously yet with the participation of all interested and able applicants. This approach has recently been reaffirmed by the Commission as in the public's interest. (See, Mobile Satellite Service In The Upper L-Band Frequencies, Final Decision on Remand, Gen. Docket No. 84-1234, [FCC 91-427], December 27, 1991.)

CELSAT submits that the merits of its HPCN concept are so superior to the AMSC proposed MSS system that the arguments must weigh even more heavily in favor of a single system approach and, thus, a single HPCN licensee. But **CELSAT**'s proposal does not ask for this much without offering up something in return. As discussed below, **CELSAT** believes that others can participate independently in the use of the same spectrum band without having to join a consortium.

C. The Commission Should Adopt HPCN Rules That Encourage "Pseudo" Spectrum Sharing

As pointed out above, a true and full *hybrid personal communications network* as proposed by **CELSAT** must be under the control of and operated by one licensee. It is simply technically and practically necessary to operate it that way. However, this is not to say that the huge capacity of any one HPCN *space segment* cannot be licensed and operated differently from the combined HPCN ground/space system, and **CELSAT** is confident that it can be. Specifically, **CELSAT** submits that the Commission should adopt a policy and rule provisions which allow for a form of "pseudo spectrum sharing", as proposed below.[44]

As background to this proposal, **CELSAT** would refer to the current requirement of Section 25.141(e) of the Commission's rules which effectively mandates spectrum sharing of the L/S-Band by multiple RDSS licensees on the basis of coding and power limiting techniques. As the many comments and diverse positions of competing parties point out in connection with the pending applications and the associated requests for rulemaking,[45] this absolute spectrum sharing requirement will prove to be unworkable for mixed-use MSS/RDSS services. It is also incompatible with alternative multiplexing schemes (i.e., TDMA) being proposed by

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[44] Such pseudo sharing should not be required. **CELSAT** is proposing that the Commission merely permit such sharing, and leave it the individual HPCN applicant(s) to propose whether and, if so, how much spectrum capacity each would be willing to offer under such an option. **CELSAT** is filing an application for HPCN authority and request for Pioneers Preference in which it is proposing to offer up to 18% of its space capacity under a pseudo sharing arrangement.

[45] Id., n.'s 3, 6.